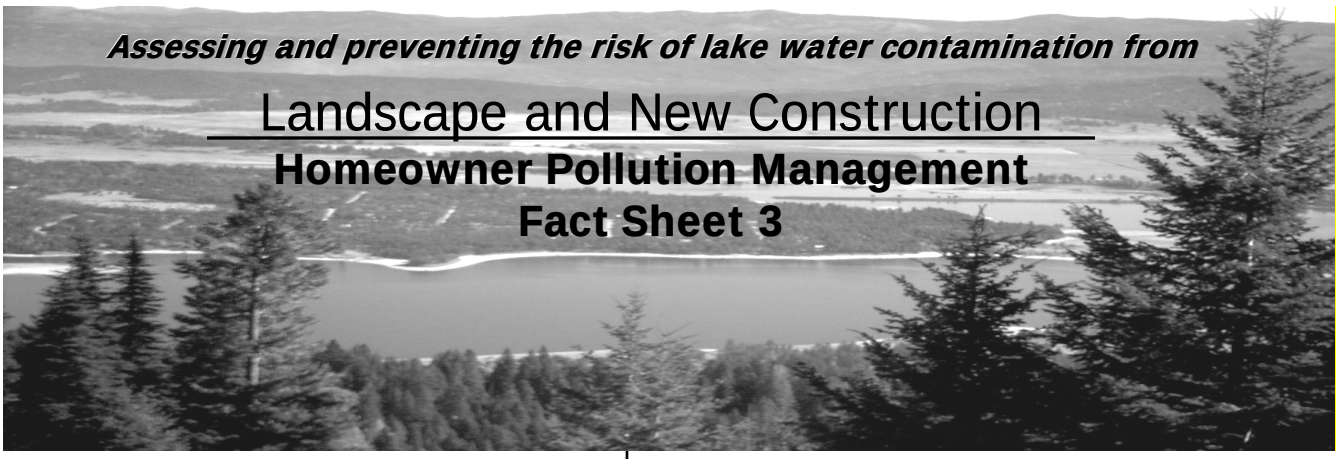


Assessing and preventing the risk of lake water contamination from

Landscape and New Construction

Homeowner Pollution Management

Fact Sheet 3

Best Management Practices

Best Management Practices (BMPs) are actions you can take to reduce your impact on the environment. This fact sheet describes BMPs you can adopt on your property to prevent water contamination, improve water quality, and enhance your lots aesthetics and value.

Site Planning

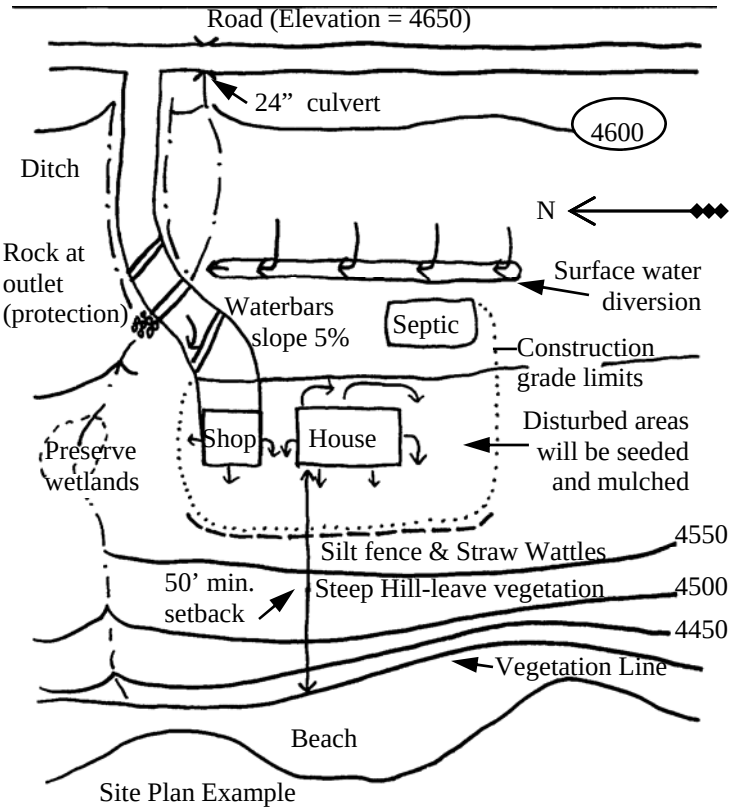
Site planning is an essential tool in preventing pollutants from being transported off-site. A general step-by-step process is recommended for those developing or redeveloping near Lake Cascade, especially on steep slopes or gradients, and highly erodible soils. The purpose of site planning is to reduce site runoff and erosion through planning considerations based on the conditions of your site.

Developing Your Site Plan

The site plan should be based on your long-term objectives and the suitability of the land for these uses, with precautions taken to prevent soil erosion and water pollution. With these considerations in mind, your site plan will optimize the natural beauty and attributes of your property. The site plan can be a one-year, ten-year, or a twenty-five year plan, depending on your resources and time. But remember, the longer you wait, the more difficult and costly it will become to fix erosion problems.

Importance of a Landscape Site Plan

Plants and trees help hold the soil and prevent erosion, especially on steep slopes. Any time existing vegetation is removed the bare soil that is exposed can be easily washed into Lake Cascade. Soil erosion can lead to structural damage, reduce soil fertility, and fill in road ditches. It harms Lake Cascade and basin streams by causing excess sedimentation, killing aquatic bottom life, and disrupting spawning. The sediment, with accompanying nutrients, may lead to algal blooms, and reduced aesthetic appeal. All of these potential problems are expensive to correct and more importantly, can be avoided by proper water and land-use practices.



Site Plan Example

As in the example above a site plan should include: roads, buildings, topography, shoreline, and plants.

Layout of Your Grounds

You can manage your buildings and grounds to reduce water runoff problems in several ways. Locate driveways, walks, and yard and garden edges to follow level contours and gentle slopes. Do not lead water directly downhill. This gives it maximum speed and cutting power for erosion. Long, steep slopes have the greatest erosion potential. Consider putting small dams at intervals in ditches to slow runoff water and trap sediment. Cross-slope designs are better than up-and-down-hill ones.

BMPs for Landscaping

- **Keep the site covered**. Any disturbances of ground cover (grass or shrubs) will expose soil. This leads to erosion and slope failure. Use hay or straw as mulch to cover disturbed areas after reseeding. A good rule of thumb is one 50-pound bale per 500 square feet. Consider working only in a small area and stabilizing that site before disturbing another.

- **Minimize disturbance to plants and trees**. Select and save trees to gain time in landscaping later. Protect trees from heavy equipment by encasing them with heavy planks tied vertically around the trunks. Large trees can be killed by heavy traffic that compacts the soil. Putting fill material too deeply over the root area can also kill trees**.**

- **Maintain a filter strip of natural vegetation along the banks of Lake Cascade and streams**. The best filter strip is mature woodland with undisturbed grass and shrub layers.

- **Establish permanent cover**. After your grounds have been graded to minimize and control runoff, the next step is to plant a permanent cover on all areas that have been disturbed. Trees and shrubs are excellent at protecting soil from rain and are practical erosion-control measures. Use native types of trees and shrubs wherever possible. They are well adapted to our climate, insects, and diseases. Native trees and shrubs also create a landscape that needs minimal maintenance and is more natural.

- **Plant trees and shrubs** to help buffer harsh winter winds and provide shade during hot summer days. Plants also serve as a living "fence" to provide privacy and excellent habitat for birds and other wildlife.

Keep bare soils to a minimum. *Picture 1, erosion of the soil surface from roof runoff. Picture 2, Because of the steep slope water carries sediment into the lake. Picture 3, is a perfect example of what to do by retaining existing vegetation.*

- **Use pesticides and fertilizers carefully**. Use only approved pesticides and follow label directions. Refer to the Lawn and Garden Fact sheet for more information.
- **Plan streets and roads**. Roads that follow general contours and moderate slopes offer less obstruction to natural drainage. They are also easier to stabilize and maintain. Where you have steep slopes consider putting in "water bars." These are small, raised ridges on the road surface. They help to route runoff water to road ditches, rather than allowing it to run the entire length of the slope. Properly sized culverts are also important for a well-drained roadbed. Refer to the Access Roads and Driveways fact sheet for more information.
- **Control runoff**. Rainfall and snowmelt runoff should be directed to safe drainage-ways so that water will not scour and wash away soil. Curbs of dirt, timber or other materials can be placed at the crests of steep hills or cuts to divert runoff. They collect runoff and lead it downhill to a safe outlet. Refer to the Stormwater Runoff fact sheet for more information.

  Don't forget that "hard" surfaces are impermeable to water and increase runoff. These impermeable surfaces include building roofs, roads, driveways, and patios. Minimize the amount of hard surfaces to help control excess runoff.

To prevent runoff damage by water:

- keep it **spread out**, moving slowly.
- **divert** it away from sensitive areas.
- direct it to **flow over erosion-resistant materials** such as dense sod, rocks, plastic sheeting, or concrete.
- **protect natural drainage ways from** filling with sediment.

New Construction BMPs

Construction activities are one of the more common sources of non-point source pollution. If you are disturbing more than an acre of land then you may be required to obtain an EPA Construction General Permit to satisfy the requirements of the NPDES program (brochure enclosed).

The removal of site vegetation during construction exposes bare ground to precipitation. When erosion prevention measures are inadequate and sediment control is not used, large volumes of sediment can be transported off-site during storms and snowmelt. This sediment can adversely affect storm drains, streams, and lakes.

Construction site erosion prevention and sediment control are important in protecting existing and future water quality. Erosion prevention should be the first choice, using such measure as (1) timing of construction to coincide with the dry season, (2) preserving native vegetation, (3) covering stockpiles, and (4) mulching and matting. Please refer to the ***Handbook of Valley County Storm Water Best Management Practices*** for additional measures. Maintaining natural vegetation and stabilizing exposed soil surfaces helps in preventing erosion; however, this is not always possible at each construction site.

If construction cannot be postponed until the dry season, sediment control is the preferred alternative for trapping sediment on-site. The following measures are practical and cost-effective: (1) temporary berms, (2) straw bale barriers, and (3) silt fence.

Additional site planning may be necessary to protect water quality in circumstances where the construction site is near a sensitive water resource, such as a creek, stream, or Lake Cascade; along a steep slope (greater than 30 percent); within an area of porous soil; or a shallow water table. A certified professional can provide direction in developing an erosion and sediment control plan prior to development, if site conditions warrant more attention. An erosion and sediment control plan outlines each construction activity beforehand, accounting for possible impacts to sensitive ecological areas.

Timing of Construction

Construction work and erosion prevention applications should be scheduled so they occur under optimal conditions. Optimal conditions consist of dry, low runoff periods during the year when erosion is lowest, usually summer.

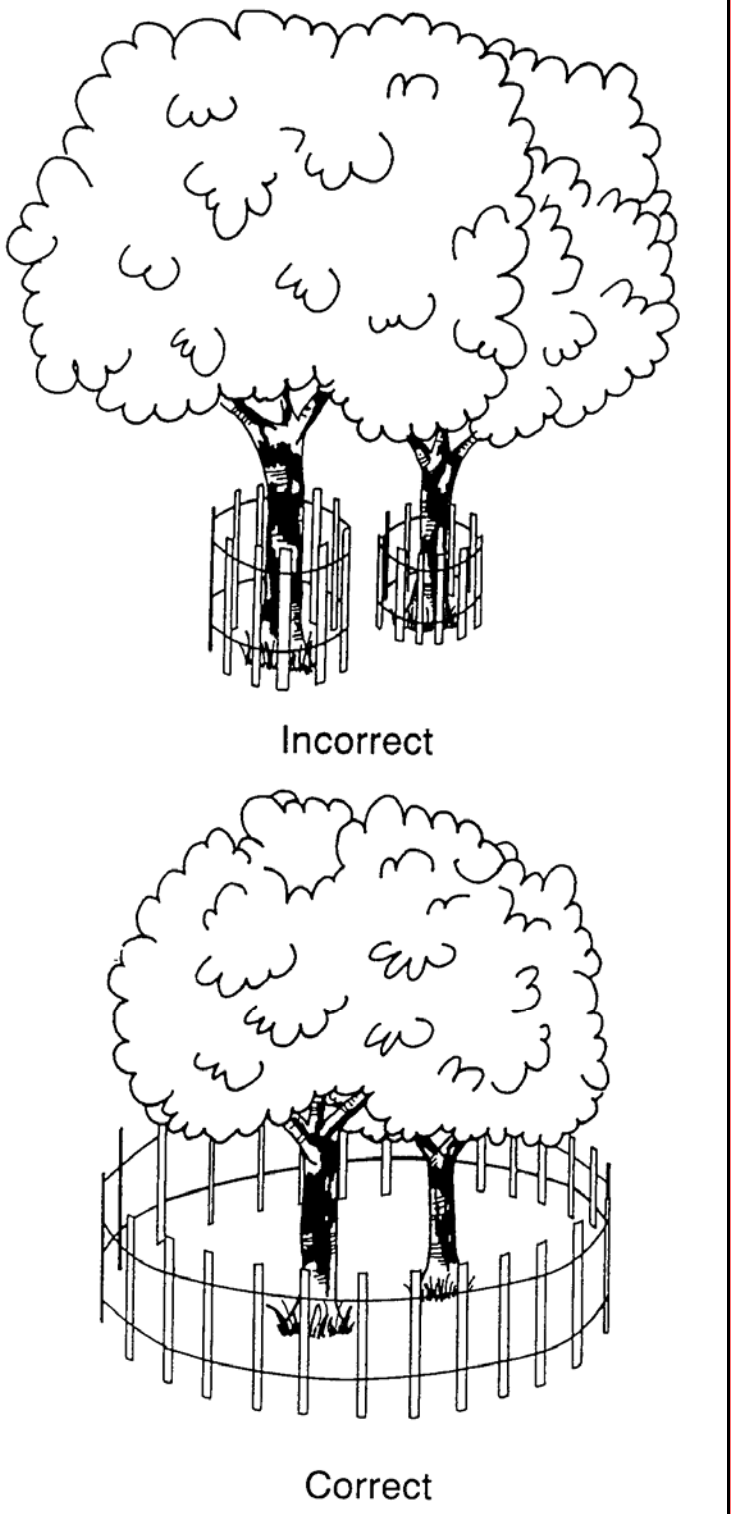
Preserving Native Vegetation

Minimizing disturbance or restricting construction to a specified area on the site or a right-of-way can protect existing vegetation (including trees, grasses, and other plants). By preserving natural vegetation, a natural buffer zone or a stabilized area helps prevent erosion. A desired vegetative buffer strip would be a minimum of 20 feet back into the property within which are planted indigenous grasses and plants that do not require fertilizers and artificial watering. This measure also minimizes the amount of bare soil exposed to erosive forces. Areas where preserving vegetation can be particularly beneficial are floodplains, wetlands, streambanks, steep slopes, and other areas where other structural sediment controls would be difficult to establish, install, or maintain. Preserving natural vegetation has many advantages:

- It does not require time to re-establish vegetation.
- It can handle higher quantities of storm runoff than newly seeded areas.
- It usually requires less maintenance, watering, and chemical application, than newly planted or seeded areas.
- It has greater filtering capacity because the vegetation and root structure are usually denser in preserved natural vegetation than in newly seeded or bare areas.

Successful preservation of vegetation requires good planning and site management to minimize the impact of construction activities. The areas to be preserved should be identified early during the planning stage and be clearly marked in the field before any work on-site begins. Other useful practices are as follows:

- Clearly mark any trees to be preserved, and protect roots against ground disturbance within the dripline of each marked tree (see figure at the right). The dripline marks the edge of the tree's foliage where moisture from rainfall would drop. Most of the tree's roots lie within the dripline and are vulnerable to damage.
- Consider the use of design alternatives in order to preserve natural vegetation in certain areas where it typically would be removed and where its preservation would not pose safety problems.
- Perform maintenance activities as needed to ensure that the vegetation remains healthy and aids in erosion prevention and sediment collection. Inspect the preserved vegetated areas at regular intervals to make sure they remain undisturbed and are not overwhelmed by sediment.



Barriers should be installed at the drip line of tree branches.

Covering Soil Piles

Short-term soil piles should be completely covered with a tarp of some kind. If the soil cannot be replaced during the same growing season in which it was stockpiled, soil piles or stockpiled soil should be seeded. The purpose of re-vegetating stockpiled soil is to reduce the potential of soil loss from erosion. Seeding will require greater maintenance during the drier summer months of July, August, and September. It may be necessary to break up the soil surface if it becomes crusted or smooth after stockpiling.

Reseed with a native grass mix. Include a nitrogen fixing species such as white clover Cover the seed with one-half to three-quarter inch of soil to improve germination. This can be done with tillage equipment, if slopes are not too steep, or by hand raking. It may be necessary to re-seed after one growing season.

Mulching

Mulching temporarily stabilizes soil and acts to control erosion through use of such materials as straw, grass, grass hay, compost, wood chips, or wood fibers. Mulching allows vegetation to re-establish, reduces soil crusting, reduces evaporation, and decreases fluctuations in soil temperature. Other materials can be used for mulching including erosion control fabrics or mats, wood residue, and hydromulch, or a combination of these materials. Mulches can be spread by hand or with machines. Mulching is done after seeding, unless otherwise noted. Mulch should be applied to disturbed areas within riparian zones (approximately 100 feet on each side of a perennial stream or within 100 feet of the lake) and buffer strips. mulch are described below.

Cut-and-fill slopes associated with private roads can also be mulched, reducing the chance for erosion and aiding in re-establishing vegetation. These areas should be evaluated on a case-by-case basis to determine the need for mulching. Several types of mulch are described below.

- Straw or hay mulch

  Straw or hay mulch is usually economical and is satisfactory under a variety of conditions. The disadvantages are that straw may absorb soil moisture in very dry conditions, resulting in poorer seed establishment; there is increased fire potential; the mulch may attract wildlife as a food source; and the mulch may include unwanted vegetation or weed seeds. Use enough mulch to cover all exposed soil, or 1.5 tons per acre. The mulch should be worked into the soil to avoid being blown away. Use only certified noxious weed free straw.

- Wood residue—wood chips, sawdust, and shavings

  This type of mulch can usually be purchased through local sources, and it is easy to apply and contains no weed seeds. It is more fire resistant than straw or hay, and chips are resistant to wind movement. The disadvantages include the following: heavy applications may prevent moisture from reaching soil; wood product mulch may be acidic; it may have nitrogen deficiency; it may float on or be dislodged by running water; and shavings and sawdust may be taken up by the wind. With a chip size of 0.5 inch or less, an application of 1.5 to 2 tons per acre is recommended.

- Erosion control fabric or mats

  Erosion control fabrics, such as jute, excelsior paper, plastic, or nets, are especially useful on steep slopes or areas with high winds where nets can be anchored in place. They can, however, be expensive, costing as much as 4 or 5 times more than tacked straw. Also, the labor cost of anchoring is high. Nets are less effective on rocky areas and very rough surfaces. Erosion beneath mats may be a problem if they are not properly installed. Costs may limit use to critical areas, such as stream banks, channels where runoff concentrates, and generally hot, dry sites.

Temporary Berms

A temporary berm is a ridge of compacted soil or sandbags that intercepts and diverts runoff from small construction areas. Temporary berms often are constructed along the top edge of fill slopes but also may be constructed across a roadway at a slight angle to the centerline. Berms are used to prevent runoff onto newly constructed slopes until permanent measures are in place. They intercept flow from the construction area and direct it to temporary slope drains or to outlets where it can be safely discharged. Since temporary berms do not provide filtration, they can only be used for minor flows.

- Soil berm

  An earth dike or soil berm should be high enough to prevent overflow and divert water to a grassy swale. Berms are normally constructed from embankment materials. Design a berm of soil with an approximate height of 1 foot with a minimum top width of approximately 2 to 2 ½ feet and side slopes of 2:1 (horizontal: vertical) or flatter.

  All soil berms should be properly located to effectively divert intercepted runoff. Runoff intercepted from disturbed areas should be diverted to

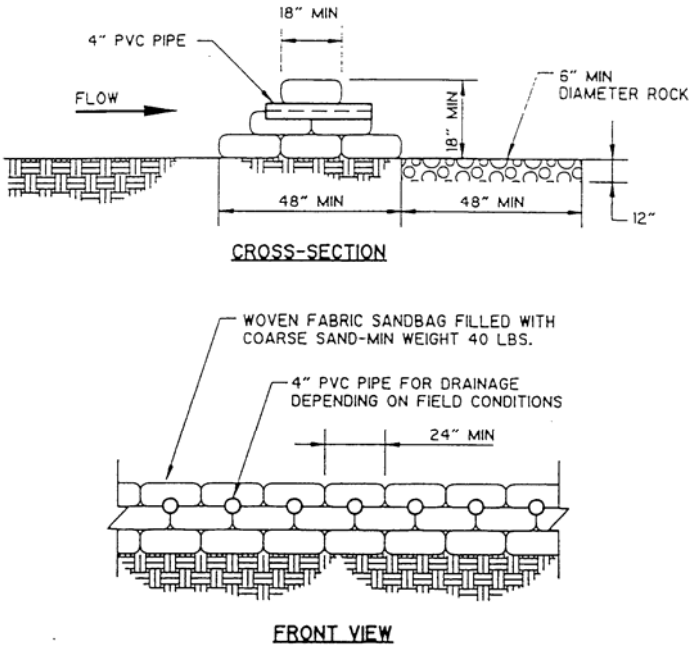
a sediment-trapping BMP such as a vegetative buffer strip, a sediment trap, a temporary or permanent grassy swale, straw bale barriers, or a silt fence. The entire width of the berm must be compacted.

- Sandbag berm

  The following dimensions are suitable for sandbag berms: height and top width are both slightly more than 1 ½ feet minimum, and bottom width between 4 ¼ to 5 feet. Each sandbag has a general length of 2 to 2 ½ feet, a width of approximately ½ foot, depth or thickness of approximately 1-1½ feet, and a weight of 90 –130 lbs.

  The sandbags should be installed to prevent flow under or between bags. When the sandbags are stacked in an interlocking fashion, it provides additional strength for resisting the force of the flowing water. However, sandbags should not be stacked more than three deep without broadening the foundation (using additional sandbags) or providing additional stability.

The sandbags should be reshaped or replaced as needed during inspection. Inspections should be made daily during wet weather. When silt reaches a depth of ½ foot behind the berm, it should be removed and disposed of at an approved site in a way that does not contribute to additional siltation. The sandbag berm should be left in place until all upstream areas are stabilized and accumulated silt has been removed. The sandbags should then be removed by hand.



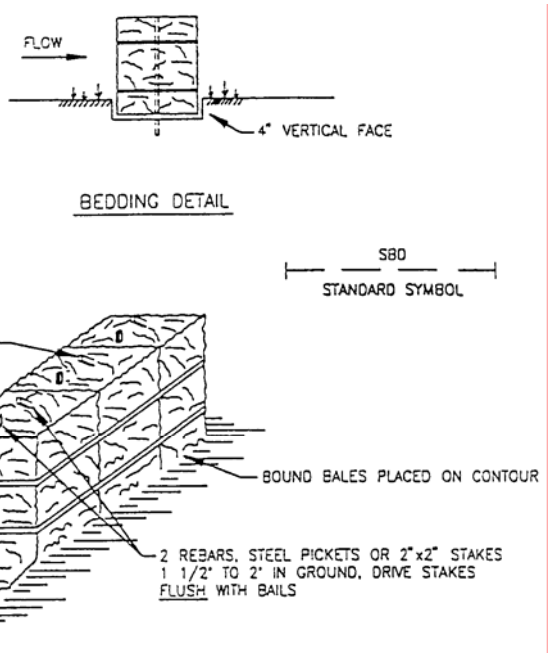
Proper sand bag berm design.

Sediment Collection BMPs

Straw Bale Barriers

Straw bale barriers are primarily used to intercept sediment-laden runoff from small drainage areas of disturbed soil. The purpose of a straw bale dike is to reduce runoff velocity and effect deposition of the transported sediment load. The straw bale barrier is used where there is no concentration of water in a channel or other drainage way above the barrier.

When **installed and maintained properly**, straw bale barriers remove most of the sediment transported in construction site runoff. This optimum efficiency can be achieved through careful maintenance, with special attention given to replacing rotted or broken bales. Straw bale barriers can be constructed from readily available materials and put in place to control runoff without causing major site disturbances. Installation, however, can be demanding work. Straw bale barriers should be used for no more than two to three months because they tend to rot and fall apart over time. Use only certified noxious weed free straw.



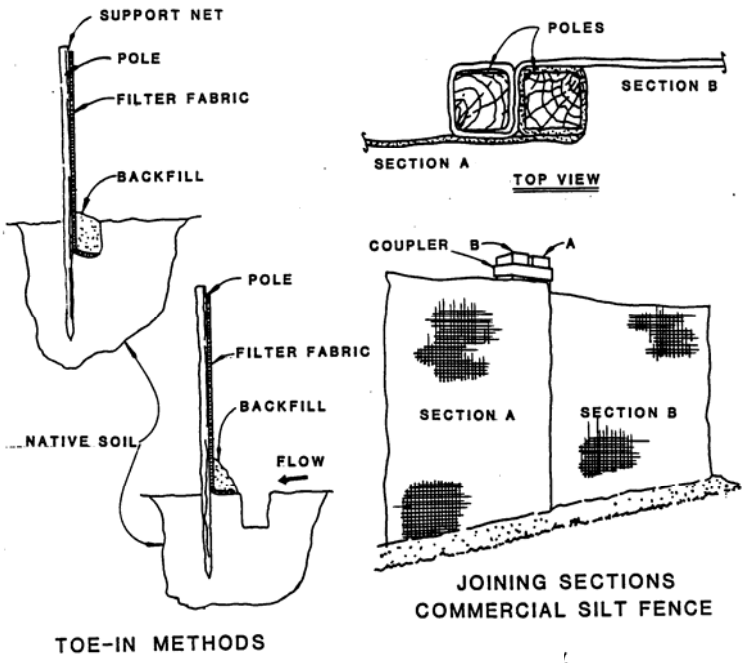
Construction Specifications:

- Bales should be placed at the toe of a slope or on the contour and in a row with ends tightly abutting the adjacent bales.
- Each bale should be embedded in the soil a minimum of 4 inches and placed so the bindings are horizontal.
- Bales shall be securely anchored in place by either two stakes or re-bars driven through the bale. The first stake in each bale shall be driven toward the previously laid bale at an angle to force the bales together. Stakes should be driven flush with the bale.
- Inspection shall be frequent and repair replacement should be made promptly as needed.
- Bales should be removed when they have served their use-fulness so as not to block or impede storm flow or drainage.

Silt Fence

A silt fence is a filter fabric that is entrenched or attached to supporting poles. The purpose of the silt fence is to detain sediment-laden water on-site and prevent soil loss. A common application of silt fence is along the perimeter of the lot or around a temporary soil pile area. Silt fences are also practical along streams or creek channels. However, they should not be installed within the channel itself or anywhere there is a concentrated flow. Silt fences have a design life of six months. Silt fences work best when reinforced with wire backing. Silt fences often do not withstand heavy snowloads and another BMP should be used if needed over the winter. Installation guidelines include:

- Allow an area behind the fence for the ponding and settling of runoff and sediment, respectively;
- Placing the silt fence along a level contour, to prevent the ponding of water that is greater than 1 ½ inches deep at any point. Ensure that the bottom of the silt fence is buried to the appropriate level.
- Weekly or periodic inspection of the silt fence to repair tears and remove sediment that reaches one-third the height of the fence.



Stormwater Filters

Stormwater filters are designed to filter pollutants out from runoff. The primary removal mechanisms employed by these facilities are straining and settling, which allow capture of coarse to fine sediments and the pollutants adhered to them. Vegetated filters such as bioswales also offer limited nutrient uptake in plants as well as sorption in underlying soils. The term biofiltration has been coined to describe the more or less simultaneous process of filtration, infiltration, adsorption, and biological uptake of pollutants in stormwater that takes place when runoff flows over and through vegetated treatment facilities.

In vegetated systems, the degree to which the above mechanisms operate will vary considerably depending upon many factors, such as the depth and condition of the vegetation, the velocity of the water, the slope of the ground, and the texture of the underlying soil. However, the most important design criterion is the residence time of the stormwater in the biofilter, provided there is an adequate stand of vegetation and the underlying soil is of moderate texture. Therefore, to be effective, the biofilter must be designed so that the residence time is sufficient to permit most, if not all, of the particulates and at least some of the dissolved pollutants to be removed from the stormwater.

Stormwater filters can be used for a variety of land uses. However, they may not be suitable where the runoff contains high sediment loads over long periods, unless the facility is inspected and maintained frequently.

The following stormwater filter BMPs should be used when diverting runoff from a construction site. A detailed discription for the design and construction of these BMPs can be found in the ***Handbook of Valley County Storm Water Best Management Practices.***

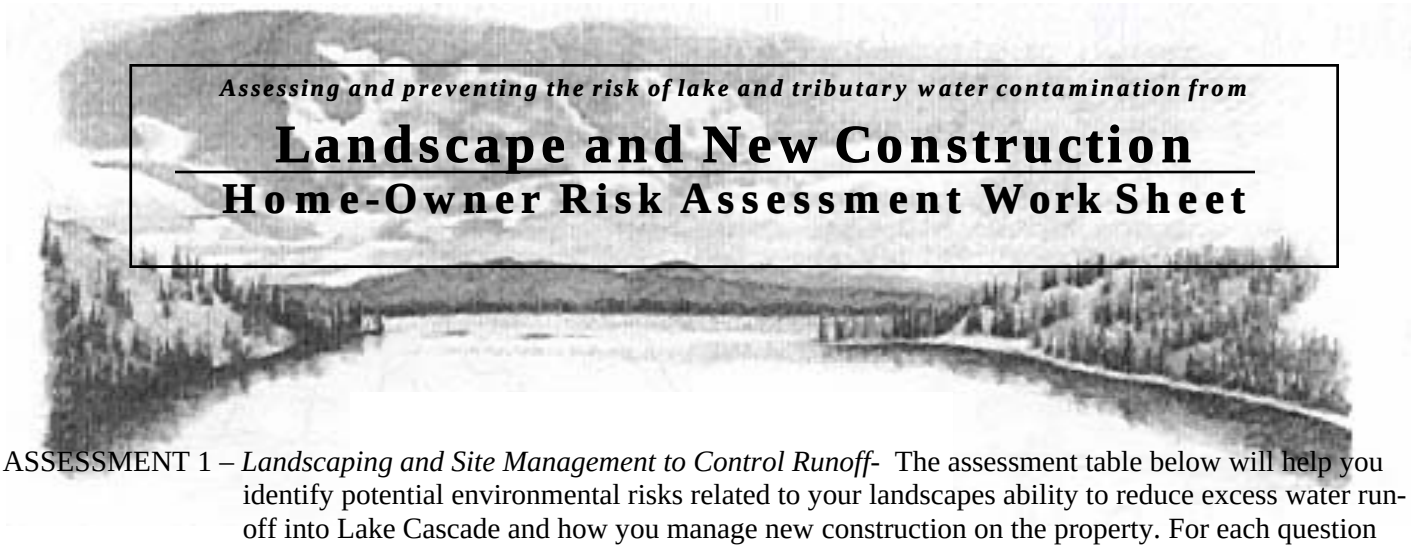
Vegetated Swale– Or grassed waterway is designed to provide treatment of conventional pollutants but not nutrients.

Vegetated Filter strip– is designed to provide runoff treatment of conventional pollutants but not nutrients. Very effective at pretreating runoff prior to a filtration BMP.

Sand Filter– filter stormwater runoff through a sand layer into an underdrain system which conveys the treated runoff to a detention facility.

Compost Stormwater Filter– mechanical filter to remove fine sediments, metals, and degrade organic compounds such as oil and grease. Needs to be used with other BMPs such as a sediment trap.

Catchbasin Inserts– are generally used under a storm drain grate providing water quality treatment through filtration, settling, or adsorption.



Assessing and preventing the risk of lake and tributary water contamination from

Landscape and New Construction

Home-Owner Risk Assessment Work Sheet

ASSESSMENT 1 – *Landscaping and Site Management to Control Runoff-* The assessment table below will help you identify potential environmental risks related to your landscapes ability to reduce excess water run-off into Lake Cascade and how you manage new construction on the property. For each question indicate your risk level in the right-hand column. Some choices may not correspond exactly to your situation. Choose the response that best fits. When finished turn to the **Action Checklist** on page 11and record your medium and high-risk practices. Your goal is to lower your risks. Use the BMP recommendations on pages 1-7 to help you decide how to best reduce pollution.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Site Plan:	A site plan has been developed for preventing erosion and pollutants from being transported off-site.		No site plan has been developed for making clean water a priority.	❒ Low ❒ Medium ❒ High
Topography, slope of site from potential pollution source toward the lake or a stream:	0-2% slope	3-4% slope	5% and above	❒ Low ❒ Medium ❒ High
Retention of existing native vegetation:	Plants and trees that help hold soil in place and prevent erosion are protected and preserved whenever landscaping or doing new construction.	Not all trees and plants are retained during construction projects. Areas that are under construction are revegetated when finished.	Preserving vegetation is not taken into consideration when constructing or landscaping.	❒ Low ❒ Medium ❒ High
Landscaping and buffer strips:	Yard is landscaped to slow the flow of stormwater and provide areas where water soaks into the ground. Buffer strips of thick vegetation are left along streams or lakeshores.	No areas are landscaped to encourage water to soak in, but yard is relatively flat and little runoff occurs. Mowed grass or spotty vegetation exists adjacent to a stream or lake.	There is no landscaping to slow the flow of stormwater, especially on steep slopes, erodible properties. Stream banks or lakeshores are eroding.	❒ Low ❒ Medium ❒ High

ASSESSMENT 1 CONTINUED– *Landscaping and Site Management to Control Runoff.*

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Roads, driveways, and openings:	All BMPs required to prevent erosion and protect water quality are identified during the design and construction of roads, trails or driveways, which is done in consultation with an engineer. BMPs are frequently inspected and maintained.		Roads, trails and openings are bare and eroding. No effort is taken to reduce road or skid construction in a riparian area.	❒ Low ❒ Medium ❒ High
Control Runoff:	Rainfall and snowmelt runoff is directed into areas appropriate for collecting runoff, so that water will not scour and wash away soil.		No landscape changes made to slow the flow of stormwater, especially on steep erodible slopes.	❒ Low ❒ Medium ❒ High

ASSESSMENT 2 – *Other Landscaping Considerations.* When finished turn to the **Action Checklist** on page 11 and record your medium and high-risk practices. Use the BMP recommendations on pages 1-7 to help you decide how to best reduce pollution.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Landscaping maintenance to protect property from forest fire:	Leaf clutter, dead trees and branches, firewood, and unused old timber is taken to an approved landfill and/ or stored away from the house and other out buildings.		Leaf clutter, dead and down trees, and old unused lumber are not stored away from buildings.	❒ Low ❒ Medium ❒ High

ASSESSMENT 3 – *Construction site erosion prevention*– is important in protecting existing and future water quality. Construction sites close to water bodies have a greater potential for affecting water quality. Maintaining natural vegetation and stabilizing exposed soil surfaces helps prevent erosion. When finished turn to the **Action Checklist** on page 11 and record your medium and high-risk practices. Use the BMP recommendations on pages 1-7 to help you decide how to best reduce pollution.

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Timing of Construction:	Construction work and erosion prevention applications are scheduled for optimal conditions; dry, low runoff periods when erosion is lowest.	Construction work is performed during the wet season, but erosion prevention BMPs are used to help reduce runoff.	Construction work is performed during the wet season and no erosion prevention BMPs are used.	❒ Low ❒ Medium ❒ High
Sediment Control:	On construction sites close to water bodies sediment control devices like temporary berms, straw bale barriers, or silt fencing are used. And on steeper slopes (greater than 30%) additional measures are taken with professional assistance.	Construction site is protected by natural vegetation, but no man-made sediment control devices are used.	No sediment control BMPs are used during construction to keep water laden with sediment from running directly into Lake Cascade.	❒ Low ❒ Medium ❒ High
Bare soil during construction projects:	Areas of bare soil are seeded and topped with a layer of mulch or straw. Sediment control devices (straw bales, silt fence, or berms) are used especially on steeper slopes until grass is established.	Soil is left bare during a construction project, but natural features slow and treat most runoff.	Soil is left bare and no natural features or sediment control devices are used.	❒ Low ❒ Medium ❒ High
Proximity to surface water:	>500 feet to surface water.	300-500 feet to surface water.	10-300 feet to surface water.	❒ Low ❒ Medium ❒ High

ACTION CHECKLIST

Landscape and New Construction

Write all high and medium risks below.	**What can you do to reduce the risks?**	**Set a target date for action.**
Sample: Runoff from construction activities runs directly into a stream or the lake.	Divert water into a heavily vegetated area and place a silt fence between vegetated area and the nearest waterbody.	One week from today: June 1

Information derived from Lake*A*Syst materials is intended only to provide general information and recommendations to property owners around Lake Cascade regarding their management practices. **All results are confidential.**